

# FINAL State Water Project Incidental Take Permit Risk Assessment for Winter-run and Spring-run Chinook Salmon

## Section 1: Overview

Date: 12/13/2022

### Life Stages Present:

Winter-run Chinook salmon (juvenile)

Spring-run Chinook salmon (juvenile)

### Advice to the Water Operations Management Team (WOMT):

No advice is warranted.

For the week beginning 12/13/22, D-1641 Delta Water Quality is controlling exports at the Central Valley Project (CVP) and the State Water Project (SWP). Combined exports on 12/13/22 are 2,800 cfs resulting in an Old and Middle River Index (OMRI) of -2,400 cfs and 14.5% of inflow diverted (14-day average). The Delta Cross Channel (DCC) gates are projected to remain closed for seasonal requirement. The SWP is exporting this week and no outages are planned.

SaMT estimates an overall low risk of entrainment into the central Delta for juvenile natural-origin winter-run Chinook salmon (WR). Flows at Freeport are high and the DCC gates are closed. Entrainment into Georgiana and Threemile Slough is possible but low according to the STARS model. WR have been observed in real-time monitoring sites in the Delta this week; however, only a small proportion of the population is estimated to be in the Delta. Therefore, overall entrainment risk into the central Delta remains low. SaMT estimates an overall low risk of juvenile natural-origin spring-run Chinook salmon (SR) entrainment into the central Delta. Current hydrological conditions reflect a decreased routing risk for any salmonids present in the Delta due to high Freeport flows, DCC gate closure, and low entrainment predicted from the STARS model; therefore, entrainment into the central Delta for SR is unlikely this week.

SaMT estimates an overall low risk of entrainment of juvenile WR into the export facilities this week. Salvage of WR is unlikely due to low numbers of WR occupying the Delta as indicated by low numbers of observations in the real-time monitoring stations in the Delta and no salvage of WR yet this season. SaMT also estimates an overall low risk of juvenile SR into the export facilities due to no salvage of YOY SR occurring so far this season and low numbers of detections of YOY SR observed in real-time monitoring locations in the Delta. SaMT does not anticipate that COA 8.6.2 Early Season Natural Origin WR Discrete Daily Loss Threshold of 26 older juvenile Chinook salmon will be exceeded during this upcoming week.

Risk Assessment:

Section 2-A: Operations and Fish Distribution Table

The COA 8.6.2 (Early Season Natural-Origin WR Discrete Daily Loss Threshold) is currently in effect with a daily loss threshold of 26 or more for the month of December. COA 8.6.2 has not been triggered for WY 2023.

Table 1: Current Juvenile Fish Distribution. The SaMT group agreed to provide distribution estimates in five percent increments when feasible.

Location	Yet to Enter Delta	In the Delta	Exited the Delta
YOY winter-run Chinook salmon <sup>1</sup>	Current 85-95% Last week 90-100%	Current 5-15% Last Week 0-10%	Current 0% Last Week 0%
YOY spring-run Chinook salmon	Current 95-99% Last week 100%	Current 1-5% Last Week 0%	Current 0% Last Week 0%
Hatchery origin winter-run Chinook salmon	Current NA Last week NA	Current NA Last Week NA	Current NA Last Week NA

Section 2-B: Sacramento River and Confluence

**Assessment of risk of entrainment into the central Delta for WR and SR in the Sacramento River: (8.1.5.1 C ii, iii, iv and 8.1.5.1 B iii)**

- Exposure Risk:
  - WR: Low
  - SR: Low
- Routing Risk:
  - WR: Low
  - SR: Low
- Overall Entrainment Risk:
  - WR: Low
  - SR: Low
- Change in risk of entrainment into the central Delta (increased/decreased risk compared to last week):
  - WR: Similar to previous week
    - Exposure Risk is estimated as low this week. SaMT estimates 5-15% of the WR population is present in the Delta, with some observations at in-Delta beach seine monitoring. Routing Risk remains low this week based on hydrologic conditions, DCC gates being closed, STARS model predicting a low routing probability in Georgiana Slough, and Freeport flows remaining high due to the storm that occurred last week. Therefore, overall risk of entrainment of WR into the central Delta is still estimated to be low.
  - SR: Similar to previous week
    - Exposure Risk is estimated as low this week. SaMT estimates 1-5% of the SR population is present in the Delta, with some observations at the Lower Sacramento River RST and in-Delta beach seine monitoring. Routing Risk remains at low this week based on hydrologic conditions, DCC gates being closed, and Freeport flows remaining high due to

the storm that occurred last week. The storm event last week moved some SR downstream and into the Delta, but SR are still being detected in low numbers in the Delta. Therefore, overall risk of entrainment of SR into the central Delta is still estimated to be low.

## Section 2-C: Facilities Risk

### Central Valley Project/State Water Project (CVP/SWP) facilities entrainment risk for WR and SR in the central Delta over the next week (8.1.5.1 D iii, iv, v)

- Exposure Risk:
  - WR: Low
  - SR: Low
- Reporting OMR/Export Risk:
  - Baseline OMR (-1,100 cfs)
    - WR: Low
    - SR: Low
  - Scenario 1 OMR: (-2,400 cfs)
    - WR: Low
    - SR: Low
  - Scenario 2 OMR: (-8,500 cfs)
    - WR: High
    - SR: High
- Overall Entrainment Risk:
  - WR: Low
  - SR: Low
- Change in risk of entrainment into the facilities (increased/decreased risk compared to last week):
  - WR: Similar to previous week
    - Exposure Risk is low this week due to no WR salvage occurring for WY 2023. Reporting OMR/Export Risk is low this week under an OMRI of -2,400 cfs scenario, but increases to high under the -8,500 cfs scenario expected later in the week. Exposure Risk is low this week since no WR salvage has occurred so far for WY 2023. Exports are expected to increase later this week due to increased flows from last week's storm. Therefore, the overall entrainment risk of WR into the export facilities is estimated to be low this week.
  - SR: Similar to previous week
    - Exposure Risk is low this week since no natural SR salvage has occurred so far for WY 2023. A hatchery SR released on 5/5/22 was observed at the SWP salvage facility on 12/4/22 while OMRI was held at -1,100 cfs. Reporting OMR/Export Risk is low this week under an OMRI of -2,400 cfs scenario, but increases to high under the -8,500 cfs scenario expected later in the week. Exports are expected to increase later this week due to increased flows from last week's storm. Therefore, the overall entrainment risk of SR into the export facilities is estimated to be low this week.

## Section 2-D: Annual Loss Threshold Risk

- Annual loss threshold risk and Alternative Actions (8.1.5.1. E I, ii, iii and 8.1.5.1 F I, ii)
  - Loss at the SWP and CVP facilities compared to the estimated remaining population in the Delta and upstream of the Delta: Salvage of California Endangered Species Act (CESA)-listed Chinook salmon has not occurred.

- Define risk of hitting a threshold, 50%, or 75%, or 100%, and likelihood of exceeding a threshold:
  - Natural-origin WR: Not Available (N/A) at this time. [1.17% of the natural-origin WR Juvenile Production Estimate (JPE)]
    - Current Annual Loss: N/A
    - 50% Threshold based on natural-origin WR JPE: N/A
      - Risk of exceeding threshold: N/A
    - 75% Threshold based on natural-origin WR JPE: N/A
      - Risk of exceeding threshold: N/A
    - 100% Threshold based on natural-origin WR JPE: N/A
      - Risk of exceeding threshold: N/A
  - Hatchery WR: N/A [0.12% of the Livingston Stone National Fish Hatchery (LSNFH) hatchery release JPE]
    - Current Annual Loss: N/A
    - 50% Threshold based on hatchery WR JPE: N/A
      - Risk of exceeding threshold: N/A
    - 75% Threshold based on hatchery WR JPE: N/A
      - Risk of exceeding threshold: N/A
    - 100% Threshold based on hatchery WR JPE: N/A
      - Risk of exceeding threshold: N/A

#### Section 2-E: Daily Loss Threshold Risk

- Daily loss threshold risk and Alternative Actions
  - Loss at the SWP and CVP facilities compared to estimated remaining population in Delta and upstream of the Delta:
    - Daily loss thresholds and subsequent loss and associated operations:
      - COA 8.6.2 Early Season Natural-Origin WR Discrete Daily Loss Threshold:
        - December Monthly Daily Loss Threshold: 26 per day older juvenile Chinook salmon
          - Highest Daily Loss: 0
          - Risk of exceeding threshold: Low

#### Section 3: Basis for Advice

The 2020 [Incidental Take Permit for Long-Term Operation of the State Water Project in the Sacramento-San Joaquin Delta 2081-2019-066-00](#) (SWP ITP) states that advice to Water Operations Management Team (WOMT) shall be consistent with the Project Description, COA in the ITP, and the applicable ESA authorizations. This week's advice is based on the following COAs which are currently applicable:

*List relevant COA number and title based on species/life stage, time of year, etc.:*

*8.1.4 Collaborative Approach to Real-time Risk Assessment. Beginning no later than October 1 through the end of OMR Management (see Condition of Approval 8.8) the Smelt and Salmon Monitoring Teams shall meet weekly, or more often as required, to consider survey data, salvage data, and other pertinent biotic and abiotic factors and prepare risk assessments as described in Conditions of Approval 8.1.1, 8.1.2, 8.1.5.1 and 8.1.5.2.*

*The Smelt and Salmon Monitoring Teams shall prepare operations advice for the WOMT as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, 8.7, and 8.8, including*

*advice on operations. The Smelt and Salmon Monitoring Teams shall each prepare risk assessments and operations advice. Within each team, staff jointly develop the risk assessment and supporting documentation to accompany operations advice (see Conditions of Approval 8.1.5.1 and 8.1.5.2). DWR and CDFW Smelt and Salmon Monitoring Team staff may conclude different operations advice is warranted, in which case the difference shall be noted and elevated as described in this Condition of Approval.*

*The Smelt and Salmon Monitoring Teams shall communicate their advice to WOMT. The WOMT shall then confer and attempt to reach a resolution and agreed-upon Project operations. If a resolution is reached, Permittee shall operate consistent with the decision regarding Project operations from WOMT. If the WOMT does not reach a resolution, the CDFW Director may require Permittee to implement an operational recommendation provided by CDFW. CDFW will provide its operational decision to Permittee in writing. Permittee shall implement the operational decision required by CDFW. Permittee shall ensure that its proportional share (see Condition of Approval 8.10) of the OMR flow requirement as a part of the operational decision is satisfied.*

*8.1.5 Real-time Risk Assessments. The Smelt and Salmon Monitoring Teams (Conditions of Approval 8.1.1 and 8.1.2) shall prepare weekly risk assessments, or more often as required, and operations advice (as required by Conditions of Approval 8.3.1, 8.3.3, 8.4.1, 8.4.2, 8.5.1, 8.5.2, 8.6.1, 8.6.2, 8.6.3, 8.6.4, and 8.7) during their discussions and analyses. The Smelt and Salmon Monitoring Teams shall provide the risk assessments and pertinent supporting information to the WOMT (Condition of Approval 8.1.3) within one business day of each meeting.*

*8.6.1 Winter-run Single-year Loss Threshold. In each year, Permittee shall, in coordination with Reclamation, operate the Project to avoid exceeding the following single-year loss thresholds:*

- Natural WR (loss = 1.17% of natural WR JPE)*
- Hatchery WR (loss = 0.12% of hatchery WR JPE)*

*The loss threshold and loss tracking for hatchery WR does not include releases into Battle Creek.*

*Loss of WR at the CVP and SWP salvage facilities shall be calculated based on LAD criteria for run assignment.*

*Annual loss of natural and hatchery WR at the CVP and SWP salvage facilities shall be counted cumulatively beginning November 1 each calendar year through June 30 the following calendar year.*

*WR shall be identified based on the Delta Model LAD criteria. Loss shall be calculated for the South Delta Export Facilities using the 2018 CDFW loss equation (Attachment 6).*

*During the water year, if cumulative loss of natural or hatchery WR exceeds 50% of the annual loss threshold, Permittee shall restrict south Delta exports to maintain a 14-day average OMR index no more negative than -3,500 cfs through the end of OMR Management (see Condition of Approval 8.8). After 14 days of operations to maintain an OMR index no more negative than -3,500 cfs, Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and loss of natural and hatchery WR is no longer present. Risks shall be measured against the potential to exceed the next single-year loss threshold. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4.*

*The -3,500 cfs OMR flow operational criteria, adjusted and informed by this risk assessment, shall remain in effect until the end of OMR Management (Condition of Approval 8.8).*

*During the water year, if cumulative loss of natural or hatchery WR at the CVP and SWP salvage facilities exceeds 75% of the single-year loss threshold, Permittee shall restrict OMR to a 14-day moving average OMR flow index that is no more negative than -2,500 cfs through the end of OMR Management (Condition of Approval 8.7). After 14 days Permittee may convene the Salmon Monitoring Team to conduct a risk assessment (Condition of Approval 8.1.5.1) and determine whether the risk of entrainment and take of natural and hatchery WR is no longer present. The results of this risk assessment and associated OMR advice shall be provided to WOMT according to Condition of Approval 8.1.3 and the decision-making process shall follow the process described in Condition of Approval 8.1.4.*

*The -2,500 cfs OMR flow operational criteria adjusted and informed by this risk assessment shall remain in effect until the end of OMR Management (Condition of Approval 8.8).*

*During the water year, if natural or hatchery WR cumulative loss at the CVP and SWP salvage facilities exceeds the single-year loss threshold, Permittee shall immediately convene the Salmon Monitoring Team to review recent fish distribution information and operations and provide advice regarding future planned Project operations to minimize subsequent loss during that year. The Salmon Monitoring Team shall report the results of this review and advice to the WOMT (see Condition of Approval 8.1.3). Operational decisions shall be made following the process described in Condition of Approval 8.1.4 (Collaborative Real Time Risk Assessment).*

*If the single-year loss threshold is exceeded, Permittee and Reclamation shall also convene an independent panel to review Project operations and the single-year loss threshold prior to November 1, as described in Condition of Approval 8.2. The purpose of the independent panel is to review the actions and decisions contributing to the loss trajectory that lead to an exceedance of the single-year loss threshold, and make recommendations on modifications to Project implementation, or additional actions to be conducted to stay within the single-year loss threshold in subsequent years.*

*Permittee shall, in coordination with Reclamation, continue monitoring and reporting salvage at the CVP and SWP salvage facilities. Permittee and Reclamation shall continue the release and monitoring of yearling Coleman National Fish Hatchery (NFH) late fall-run and yearling SR surrogates. The Salmon Monitoring Team shall use reported real-time salvage counts along with qualitative and quantitative tools to inform risk assessments (see Condition of Approval 8.1.5.1).*

*8.6.2 Early-season Natural Winter-run Chinook Salmon Discrete Daily Loss Threshold. To minimize entrainment, salvage, and take of early-migrating natural CHNWR Permittee shall restrict south Delta exports for five consecutive days to achieve a five-day average OMR index no more negative than -5,000 cfs when daily loss of older juveniles (natural older juvenile Chinook salmon) and yearling CHNSR used as a surrogate for CHNWR) at the SWP and CVP salvage facilities exceeds the following thresholds:*

- From November 1 – November 30: 6 older juvenile Chinook salmon*
- From December 1 – December 31: 26 older juvenile Chinook salmon*

*All natural older juvenile Chinook salmon juveniles shall be identified based on the Delta Model length-at-date criteria. Loss shall be calculated for the South Delta Export Facilities using the equation provided in CDFW 2018 (Attachment 6). This Condition of Approval may be modified through the process described in Condition of Approval 8.6.6 and an amendment to this ITP.*

## Section 4: Hydrology and Operations

Assessment of hydrologic, operational, and meteorological information. 8.1.5.1 A

Section 4-A: Water Operations, Water Operations Outlook, and Projected Conditions C 8.1.5.1 A. i, ii, iii:

- Antecedent Actions: (e.g., Actions such as integrated early winter pulse protection, etc.)
  - No additional actions.
- Water Temperature (ITP COA 8.8 threshold: daily average water temperature exceeds 22.2° C for 7 non-consecutive days in June):
  - Mossdale (MSD): [Mossdale - CDEC](#)
    - Number of days threshold exceeded: Not applicable until June.
    - Days exceeded: Not applicable at this time.
  - Prisoners Point (PPT): [Prisoners Point - CDEC](#)
    - Number of days threshold exceeded: Not applicable until June.
    - Days exceeded: Not applicable at this time.
- Tidal Cycle: (*Spring/Neap. Note if tidal cycle has potential to affect south Delta hydrology or X2*)
  - Currently in a neap cycle and will be entering into a strong spring cycle next week with a new moon on December 23.
- Turbidity: Not discussed
- Salinity (X2): 90 km on 12/12/22
  - Hydraulic Footprint (*Provide brief description of hydrologic footprint and summary of relevant DSM2 results*): DSM2 results are unlikely to be provided during SaMT for WY 2023.
- Outages:
  - SWP: None projected
  - CVP: None projected
- Exports: 12/13/22 – 12/19/22
  - SWP: 300 to 5,000 cfs
  - CVP: 800 to 2,700 cfs
- Meteorological Forecast:
  - “Dry weather this week with cold nights and below normal highs.”
  - [NOAA - National Weather Service Forecast](#)
- Weather/Storm Event Projection:
  - Some forecasts are showing a potential storm affecting the Feather River watershed next week, but there is uncertainty about the probability and timing of precipitation.
- DCC Gates position:
  - DCC gates closed on 11/28/22 and will remain closed for seasonal requirements. DCC gates may open this month if D-1641 requirements cannot be met; however, that decision will be made on a real-time basis.
- Sacramento River flow at Freeport: 7,500 to 18,000 cfs
  - Flows are anticipated to increase later in the week as the storm pulse moved downstream.
  - [Sacramento River Flows - CDEC](#)
- San Joaquin River flow at Vernalis: 1,300 cfs
  - [San Joaquin River Flows - CDEC](#)
  - [San Joaquin River Guidance Plots - CDEC](#)
- QWEST: +8,021 cfs
  - QWEST is expected to remain positive this week.

- Future export modifications: *Describe anticipated or potential changes to exports*
  - Not applicable at this time.

*Table 2: Comparison of USGS Tidally Filtered OMR and OMR Index data.*

Date	Averaging Period	USGS gauges (cfs)	OMR Index (cfs)
12/10/22	Daily	-2,300	-1,200
12/10/22	5-day	-1,600	-1,100
12/10/22	14-day	Not Available	-1,200
12/12/22	Daily	Not Applicable	-1,100
12/12/22	5-day	Not Applicable	-1,100
12/12/22	14-day	Not Applicable	-1,200



## Section 5: Distribution and Biology

### 8.1.5.1.B Assessment of biological information for WR and SR.

#### Section 5-A: WR Population Status 8.1.5.1.B i

- Adult escapement estimate:
  - Final spawning escapement for WR adults contributing to brood year (BY) 2022 is 5,927
  - Hatchery proportion was 10.8% of the total run (641 hatchery-origin WR)
  - Total number of in-river WR females: 2,663
  - Total number of WR redds: 2,607
  - WR adults contributing to BY 2022 had a pre-spawn mortality rate of 2.1%
- Redd distribution and fry emergence timing:
  - Juvenile WR are beginning to redistribute downstream in the upper Sacramento River. There have been limited detections of WR in the real-time monitoring stations which is assumed to be due to low flows on the Sacramento River and low numbers of WR in the system. A storm event occurred from 12/8/22 – 12/11/22 which redistributed WR downstream into the Delta. Real-time monitoring locations saw increases in WR catch in the upper Sacramento River and in the Delta, but there were some disruptions in monitoring due to high debris loads.
  - CDFW is conducting snorkel surveys weekly on the upper Sacramento River. In the first week of December, CDFW observed juvenile WR holding near Redding above the Red Bluff Diversion Dam (RBDD).
  - Estimated juvenile WR passage at RBDD for 12/2/22 is 160,875 fish. Average historic passage (2010-2021) as of 12/2/22 indicates 92.7% with one standard deviation of 8.9% have passed RBDD.
- Juvenile Production Estimate (JPE):
  - Not Available at this time.
- Livingston Stone National Fish Hatchery releases:
  - Releases of juvenile WR have not occurred.
  - See Appendix 4
- Distribution of natural WR:
  - See Table 1
- Distribution of Livingston Stone National Fish Hatchery Sacramento River WR and Battle Creek WR:
  - No releases have occurred at this time.
  - [CalFishTrack - Central Valley Enhanced Acoustic Tagging Project](#)

#### Section 5-B: SR Population Status 8.1.5.1.B ii

- Adult escapement estimate:
  - SR carcass counts not available.
  - Adult SR have completed their spawning.
- Redd distribution and fry emergence timing:
  - SR eggs are incubating in the gravel and fry are emerging. SR on Clear Creek have likely started emigrating with the recent storm and should be detected in the RBDD RSTs.
  - There have been detections of SR in the real-time monitoring stations on the Sacramento River, Feather River, and Butte Creek, as well as in the Delta.
- Hatchery release (in-river and downstream):
  - A SR surrogate group was released on 12/5/22 into Battle Creek. This group consisted of 71,057 late fall-run Chinook salmon with both a CWT and ad-clip mark. These fish will be tracked for OMR Storm Flex in order to protect SR yearlings. See Appendix 4 for more details.
- Distribution of natural SR:
  - See Table 1.

- Distribution of Feather River Fish Hatchery SR:
  - Not applicable at this time.

#### Section 5-C: Additional Data Sources to Assess Sensitivity to Entrainment into the Central and South Delta 8.1.5.1.C & D

- Acoustic telemetry: *Summary of acoustic telemetry tracking*
  - Not applicable at this time.
  - [CalFishTrack - Central Valley Enhanced Acoustic Tagging Project](#)
- Trawls: See Appendix 1
  - Sacramento Trawl: No salmonids were caught this week.
  - Mossdale Trawl: No salmonids were caught this week.
  - Chipps Island Trawl: No salmonids were caught this week.
- Rotary Screw Traps:
  - Knights Landing, Tisdale, and Lower Sacramento Rotary Screw Trap Data: One WR caught at Tisdale RST on 12/7/22; four SR caught at the Lower Sacramento RST between 12/6/22 and 12/7/22.
    - [Middle Sacramento River Salmon and Steelhead Monitoring](#)
  - Yuba River Rotary Screw Trap Data: Fifty SR caught between 12/7/22 – 12/9/22.
  - Redd Bluff Diversion Dam Rotary Screw Trap Data: Total passage estimates 160,875 juvenile WR have passed RBDD. Last updated on 12/2/22.
  - GCID Rotary Screw Trap Data: Five WR caught at GCID RST on 12/6/22.
    - [GCID RST Live Data](#)
  - Lower Feather River Rotary Screw Trap: No WR or SR caught this week.
    - [Middle Sacramento River Salmon and Steelhead Monitoring](#)
  - Butte Creek Rotary Screw Trap Data: Thirty-eight SR were caught between 12/6/22 and 12/12/22.
    - [Butte Creek Monitoring Programs](#)
- Seines:
  - Sacramento River Beach Seines: No salmonids were caught this week.
- Carcass Survey Data:
  - Lower American River Carcass Survey Data (See Table 5):
    - [Middle Sacramento River Salmon and Steelhead Monitoring](#)
    - Fall-run (FR) Carcass Surveys began on 10/24/22 on the Lower American River.
- Additional hatchery release notifications: *List all relevant hatchery release notifications.*
  - Coleman National Fish Hatchery (CNFH) released steelhead and late fall-run Chinook salmon into Battle Creek on 12/1/22 and 12/2/2022 (See Appendix 4).
  - San Joaquin River Restoration Program's (SJRRP) Salmon Conservation and Research Facility (SCARF) released 4,577 yearling spring-run Chinook salmon into the San Joaquin River on 12/8/2022 (See Appendix 4).
- New monitoring (as required by Condition of Approval 7.5.1, 7.5.2, and 7.5.3): *Upstream monitoring results during transfer window, additional rotary screw trap monitoring updates, additional acoustic tag study results, genetic identification results, trap capture efficiency trial results, and pathology results if available and relevant.*
  - No additional monitoring updates.
- Anticipated emigration to continue into the Delta:
  - WR juveniles are emigrating into the Delta with some upstream rearing possible. Hydrological and meteorological environmental cues could redistribute juveniles downstream. Adult SR have

finished spawning and eggs are still in gravel. SR juveniles are beginning to emigrate into the Delta this week. Hydrological and meteorological environmental cues could redistribute juveniles downstream.

- [SacPAS - Migration Timing and Conditions by Cohort](#)
- [SacPAS - Salvage Timing](#)
- Routing and Survival Analysis:
  - Delta STARS Model: See Table 6 in Appendix 1
    - [CalFishTrack - Central Valley Enhanced Acoustic Tagging Project](#)
- Tillotson entrainment model or other entrainment models as they become available:
  - The entrainment tool estimates a median of 0 WR and maximum loss of 7 WR this week. (SacPAS last updated on 12/13/22).
  - [SacPAS - Loss and Salvage Predictor](#)
- Salvage trends in relation to OMRI: *Provide overview of salvage data and insert salvage table as attachment at end of document*: Not applicable due to no salvage of salmonids for WY 2023 (See Appendix 2).
  - [USFWS - Fish Salvage Monitoring](#)

## Appendix 1: SaMT Monitoring and Modeling Data

Table 3: Fish monitoring data for the 12/13/22 SaMT meeting. The following table presents fish monitoring data summarized over the past week. Unless otherwise noted, reported sizes are fork length. FR = fall-run, WR = winter-run, SR = spring-run, LFR = late-fall-run, N/A= Not Available.

Location	GCID RST	Butte Creek RST	Tisdale RST	Knights Landing RST	Lower Sac RST	Beach Seines	Sacramento Trawl
Sample Date	12/5/22 – 12/11/22*	12/6/22 – 12/12/22	12/3/22 – 12/9/22	12/4/22 – 12/10/22* *	12/3/22 – 12/9/22	12/5/22 – 12/9/22	12/5/22, 12/7/22, 12/9/22
Chinook Adults	0	0	0	0	0	0	0
FR Chinook	0	0	0	0	0	6	0
SR Chinook	0	38	0	0	4	1	0
WR Chinook	5	0	1	0	0	9	0
LFR Chinook	0	0	0	0	0	0	0
Chinook (ad-clip)	56 LFR	0	3 WR 4 LFR	0	0	0	0
Steelhead (wild)	0	1	0	0	0	0	0
Steelhead (ad-clip)	28	0	0	0	0	0	0
Green Sturgeon	0	0	0	0	0	0	0
Flows (avg. cfs)	1288	300	5,034	4,961	9,048	N/A	N/A
W. Temp. (avg. °F/°C)	50.0°F	6.7°C	48.3°F	9.1°C	9.0°C	N/A	N/A
Turbidity (avg. NTU)	42.0	2.4	5.4	6.6	12.7.	N/A	N/A

\*On 12/7, the GCID RST cone was raised due to excessive amount of debris and damage. Water data shown is through 12/11.

\*\*KL cones raised on 12/5 due to heavy debris. Water data shown is through 12/10.

Table 3 Continued: Fish monitoring data for the 12/13/22 SaMT meeting. The following table presents fish monitoring data summarized over the past week. Unless otherwise noted, reported sizes are fork length. FR = fall-run, WR = winter-run, SR = spring-run, LFR = late-fall-run, N/A=Not Available.

Location	Chippis Is. Midwater Trawl	Mossdale Kodiak Trawl	Lower Feather RST	Feather at Herringer RST	Feather at Eye-Side RST	Yuba RST
Sample Date	12/5/22, 12/7/22, 12/9/22	12/5/22, 12/7/22, 12/9/22	NA	12/5/22 – 12/9/22	12/5/22 – 12/9/22	12/7/22 – 12/10/22
Chinook Adults	0	0	-	0	0	0
FR Chinook	0	0	-	4	6	33
SR Chinook	0	0	-	30	28	50
WR Chinook	0	0	-	0	0	0
LFR Chinook	0	0	-	0	0	0
Chinook (ad-clip)	0	0	-	0	0	0
Steelhead (wild)	0	0	-	0	0	0
Steelhead (ad-clip)	0	0	-	0	0	0
Green Sturgeon	0	0	-	0	0	0
Flows (avg. cfs)	N/A	N/A	-	1,360	650	838
W. Temp. (avg. °F/°C)	N/A	N/A	-	9.5°C	9.9°C	7°C
Turbidity (avg. NTU)	N/A	N/A	-	1.2	1.7	0.90

Table 4: Delta sturgeon tagging and monitoring.

Date	Comments
12/12/22	<ul style="list-style-type: none"> <li>1 GS was tagged on 12/8/22 at Marsh Island on the Sacramento River.</li> <li>2 juvenile GS were detected on 12/8/22 in the Sacramento River at Sherwood Lake</li> </ul>

GS = green sturgeon, WS = white sturgeon

Table 5: CDFW adult monitoring surveys (last updated 12/6/22)

Location	American River Carcass Survey	Stanislaus River Carcass Survey
Sample Dates	11/28/22 – 12/2/22	11/18/22 – 11/21/22
Live Fish	Not Available	1126
Redds	Not Available	1061
Carcasses	2,273	126
Ad-clipped	250	70
Spawn Condition	Prespawn Mortality: 18% (49/267)	Not Available
Flows (avg. cfs)	1,300	176
Water Temp (avg. °F)	54.6	Not Available

Table 6: STARS Modeling. [CalFishTrack - Central Valley Enhanced Acoustic Tagging Project](#)

Date: (12/12/22)	DCC	<u>Georgiana Slough/Interior Delta</u>	<u>Sacramento River</u>	<u>Sutter and Steamboat Slough</u>	<u>Yolo Bypass</u>
Late Fall-Run Proportion of Entrainment	Not Applicable	0.25	0.46	0.29	Not Applicable
Late Fall-Run Survival	Not Applicable	0.21	0.57	0.48	Not Applicable
Winter-Run Proportion of Entrainment	Not Applicable	0.13	0.59	0.14 Sutter 0.14 Steamboat	0
Winter-Run Survival	Not Applicable	0.07	0.40	0.35 Sutter 0.47 Steamboat	Not Applicable

## Appendix 2: Salvage Data

Table 7: SWP and CVP SaMT update (12/5/22 – 12/11/22). Trend is the current value compared to the previous week. Prepared by Kyle Griffiths on 12/12/22. These are preliminary results and are subject to revision.

Criteria	5-Dec	6-Dec	7-Dec	8-Dec	9-Dec	10-Dec	11-Dec	Trend	Weekly Summary
Wild older juvenile CHN Loss	0	0	0	0	0	0	0	→	0.00
Wild Steelhead Loss	0	0	0	0	0	0	0	→	0.00
SWP daily export (acre-feet)	606	857	0	1,045	0	1,477	1,034	↗	713
CVP daily export (acre-feet)	1,588	1,612	1,600	1,586	1,602	1,587	1,592	↘	1,595
SWP reduced counts	None	Yes	None	None	None	None	None	N/A	N/A
CVP reduced counts	None	None	None	None	None	None	None	N/A	N/A

*Table 8: Chinook salmon weekly salvage and loss combined for both the SWP and the CVP fish collection facilities between 12/5/22 – 12/11/22. Race is determined by LAD on the date of capture. Hatchery origin fish are determined by the lack of adipose fin. Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time. SWP loss is equal to salvage multiplied by 4.33. CVP loss is equal to salvage multiplied by 0.68. Prepared by Kyle Griffiths on 12/12/22. These are preliminary results and are subject to revision.*

Category	Salvage	Loss	Trend
Wild winter-run	0	0	→
Wild spring-run	0	0	→
Wild late Fall-run	0	0	→
Wild fall-run	0	0	→
Weekly Total	0	0	Not Applicable
Hatchery winter-run	0	0	→
Hatchery spring-run	4	4	↘
Hatchery late Fall-run	0	0	→
Hatchery fall-run	0	0	↗
Weekly Total	4	4	Not Applicable

*Table 9: Chinook salmon cumulative salvage and loss combined for both the SWP and the CVP fish collection facilities across WY 2023. Race is determined by LAD on the date of capture. Hatchery origin fish are determined by the lack of adipose fin. Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time. SWP loss is equal to salvage multiplied by 4.33. CVP loss is equal to salvage multiplied by 0.68. Prepared by Kyle Griffiths on 12/12/22. These are preliminary results and are subject to revision.*

Category	Cumulative Salvage	Cumulative Loss	Trend
Wild winter-run	0	0	→
Wild spring-run	0	0	→
Wild late Fall-run	0	0	→
Wild fall-run	0	0	→
Season Total	0	0	Not Applicable
Hatchery winter-run	0	0	→
Hatchery spring-run	137	125	↘
Hatchery late Fall-run	0	0	→
Hatchery fall-run	0	0	↗
Season Total	137	125	Not Applicable



*Table 10: Steelhead weekly salvage and loss combined for both the SWP and the CVP fish collection facilities for 12/5/22 – 12/11/22. Hatchery origin fish are determined by the lack of adipose fin. Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time. SWP loss is equal to salvage multiplied by 4.33. CVP loss is equal to salvage multiplied by 0.68. Prepared by Kyle Griffiths on 12/12/22. These are preliminary results and are subject to revision.*

Category	Salvage	Loss	Trend
Wild steelhead	0	0	→
Hatchery steelhead	0	0	→
Weekly Total	0	0	Not Applicable

*Table 11: Steelhead cumulative salvage and loss combined for both the SWP and the CVP fish collection facilities across WY 2023. Hatchery origin fish are determined by the lack of adipose fin. Salvage is equal to the estimated number of fish collected by the CVP and SWP fish protective facilities per unit of time. SWP loss is equal to salvage multiplied by 4.33. CVP loss is equal to salvage multiplied by 0.68. Prepared by Kyle Griffiths on 12/5/22. These are preliminary results and are subject to revision.*

Category	Cumulative Salvage	Cumulative Loss	Trend
Wild steelhead	0	0	→
Hatchery steelhead	0	0	→
Season Total	0	0	Not Applicable

### Appendix 3: Relevant Actions

Table 12. Relevant WY 2023 Criteria and Status for Listed Chinook Salmon under the SWP Long-Term Incidental Take Permit.

<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
Onset of OMR Mgmt. Salmonid Presence (8.3.2)	Jan. 1 - Jun. 30 <i>(when ≥ 5% of winter-run or spring-run are in the Delta)</i>	Not In effect	5% of the winter-run or spring-run population are present in the Delta	Winter-run = 5-15% estimated in the Delta  Spring-run = 1-5% estimated in the Delta	Increased winter-run and spring-run presence in the Delta	<b>12/13/22</b>	No Additional Comments
Winter-run yearly loss (8.6.1)	Nov. 1 - Jun. 30	In effect	Natural CHNWR (loss = 1.17% of JPE) 50% of 1.17% of JPE = N/A  Hatchery CHNWR (loss = 0.12% of JPE) 50% of 0.12% of JPE = N/A	Current yearly WR loss (natural LAD) = N/A  Current yearly WR loss (hatchery) = N/A	Not Applicable	<b>12/13/22</b>	Based on JPE (TBD)
Winter-run discrete daily loss (8.6.2)	Nov. 1 - Dec. 31	In effect	11/1-11/30: loss of 6/day unclipped older juv. Chinook salmon  12/1-12/31: loss of 26/day unclipped older juv. Chinook salmon	Max single daily loss from previous week = 0.00 fish (No older juveniles observed yet)	No change expected	<b>12/13/22</b>	No Additional Comments

<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
Mid- and Late-season Natural WR Daily Loss Threshold defined as natural origin juvenile Chinook salmon (8.6.3)	Jan 1 – May 31	Not in effect	<p>January 1 – 31: 0.00635% of the CHNWR JPE</p> <p>February 1 – 28: 0.00991% of the CHNWR JPE</p> <p>March 1 – 31: 0.0146% of the CHNWR JPE</p> <p>April 1 – 30: 0.00507% of the CHNWR JPE</p> <p>May 1 – 31: 0.0077% of the CHNWR JPE</p>	Not Applicable	Not Applicable	<b>12/13/22</b>	No Additional Comments

<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
Spring-run surrogate protection (8.6.4)	Feb. 1 - Jun. 30	Not in effect	<p>Coleman National Fish Hatchery (CNFH)</p> <p>Group 1: 0.25% of total in-river CWT fall-run release (total of 7 CWT #s)</p> <p>Group 2: 0.25% of total in-river CWT fall-run release (total of 7 CWT #s)</p> <p>Group 3: 0.25% of total in-river CWT fall-run release (total of 10 CWT #s)</p> <p>Group 4: 0.25% of total in-river CWT fall-run release (total of 4 CWT #s)</p> <p>Feather River Fish Hatchery (FRFH)</p> <p>Group 1: 0.25% of total in-river CWT spring-run release (total of 2 CWT #s)</p>	Not Applicable	Not Applicable	<b>12/13/22</b>	No Additional Comments

<u>Action</u>	<u>Timeframe</u>	<u>Current Action Status</u>	<u>Threshold(s)</u>	<u>Current Relevant Data</u>	<u>Weekly Trend</u>	<u>Last Updated</u>	<u>Comments</u>
End of OMR Management (8.8)	Jan – Jun. 30	Not in effect	More than 95% of WR and SR have migrated past Chipps Island as determined by SaMT, <b>AND</b> Daily average water temperature at Mossdale exceeds 22.2°C (71.96°F) for 7 non-consecutive days in June, <b>AND</b> Daily average water temperature at Prisoner’s Point exceeds 22.2°C (71.96°F) for 7 non-consecutive days in June	Not Applicable	Not Applicable	<b>12/13/22</b>	No Additional Comments

## Appendix 4: Hatchery Releases

Table 13. Hatchery salmon release data for BY 2022 and WY 2023.

Release Date	Hatchery	Race	CWT	Marked Release Number	Total Release	Percent Marked	Release Location	Mark	Agency	Release Type
12/1/2022	CNFH	Late Fall	05-64-84	61,399	61,399	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-85	57,217	57,217	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-86	73,060	73,060	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-87	74,344	74,344	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-90	49,664	49,664	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-91	62,246	62,246	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-92	61,939	61,939	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-94	64,648	64,648	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-95	57,334	57,334	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-96	60,582	60,582	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/1/2022	CNFH	Late Fall	05-64-97	58,530	58,530	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Production
12/5/2022	CNFH	Late Fall	05-64-88	71,057	71,057	100%	Battle Creek at CNFH	CWT and Ad-Clip	USFWS	Experimental
12/8/2022	SCARF	Spring	06-29-44	3,666	3,666	100%	San Joaquin River at Fremont Ford Bridge	CWT, Ad-Clip, PIT	CDFW	SCARF
12/8/2022	SCARF	Spring	06-19-68	911	911	100%	San Joaquin River at Fremont Ford Bridge	CWT, Ad-Clip, PIT	CDFW	SCARF

Table 14. Hatchery steelhead release data for BY 2022 and WY 2023.

Release Date	Hatchery	CWT	Marked Release Number	Total Release	Percent Marked	Release Location	Mark	Agency	Release Type
12/2/2022	CNFH	None	614,702	614,702	100%	Battle Creek at CNFH	Ad-Clip	USFWS	Production

